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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/845,557	04/30/2001	Ralph Spickermann	00-1006	2212

7590 06/14/2004

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JUN 17 2004
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EXAMINER	
LEUNG, CHRISTINA Y	
ART UNIT	**PAPER NUMBER**
2633	4

DATE MAILED: 06/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding. 6/17/06

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PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)
	09/845,557	SPICKERMANN, RALPH
	Examiner	**Art Unit**
	Christina Y. Leung	2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☒ Claim(s) *9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 9 is objected to because of the following informalities:

Claim 9 recites "to produce an amplitude and/or modulated output beam" (sic) in lines 10-11 of the claim. Examiner respectfully suggests that Applicant amend the claim to remove the words "and/or" or otherwise amend this phrase for grammatical reasons.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 17 recites the limitation "the phase symbol mapping logic" in lines 1-2 of the claim. There is insufficient antecedent basis for this limitation in the claim, since claims 11 and 14, on which the claim currently depends, do not previously recite "phase symbol mapping logic." Examiner respectfully notes that claim 17 may depend on claim 16 instead.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono et al. (US 6,388,786 B1) in view of Kahn et al. (US 6,445,476 B1) and Shimizu et al. (US 6,389,081 A).

Examiner notes that throughout this Office Action, "Kahn et al." refers to US 6,445,476 B1, not US 6,424,444 B1 cited in the previous Action.

Regarding claim 1, Ono et al. disclose a system for transmitting a modulated optical signal (Figure 8, for example) comprising:

a transmitter laser 1 for providing a laser beam;

an amplitude modulator 2 for amplitude modulating the laser beam;

a phase modulator 3 in series with the amplitude modulator for phase modulating the amplitude modulated laser beam;

an optical fiber coupled between the amplitude modulator and the phase modulator (not explicitly labeled but clearly shown in Figure 8); and

an electrical delay 9 for synchronizing the arrival of the amplitude modulated light at the phase modulator with a drive signal arriving at the phase modulator (column 7, lines 22-30).

Ono et al. also disclose an apparatus responsive to input data for generating data points that are input into the amplitude and phase modulator to amplitude and phase modulate the laser beam (column 7, lines 13-45). However, they do not specifically disclose a constellation generating apparatus for generating an arbitrary M-ary amplitude modulated and/or phase shift keyed constellation of data points.

Kahn et al. teach an optical transmission system, related to the one disclosed by Ono et al., including providing multi-level modulated optical signals using an amplitude modulator and

a phase modulator in series (elements 282 and 290 in Figure 5c, for example). Kahn et al. further disclose that a constellation generating apparatus for generating an arbitrary M-ary amplitude modulated and/or phase shift keyed constellation of data points may be used to provide input data to the amplitude and phase modulators (shown in detail in Figure 4a as providing the modulation signal s(t) that is input into the optical modulation system shown in Figure 5c, for example; column 3, lines 50-63; column 4, lines 53-55). Examiner notes that Kahn et al. teach that an "arbitrary" M-ary constellation may be generated, since they disclose that M may be simply any number greater than or equal to 2.

Ono et al. already disclose that reducing bandwidth, such as through mapping a data signal into a multi-level signal as they disclose, reduces waveform deterioration due to dispersion (column 1, lines 20-26). However, Kahn et al. particularly teach that M-ary modulation, where M is greater than 2, provides optical signals having a narrower optical spectrum than in systems where M=2 (i.e., the system disclosed by Ono et al.) and therefore dispersion would be further reduced (Kahn et al, column 2, lines 24-32; column 3, lines 11-14; column 5, lines 44-48). Therefore, it would have been obvious to a person of ordinary skill in the art to use the arbitrary M-ary constellation generating apparatus taught by Kahn et al. in the system disclosed by Ono et al. in order to provide optical signals having a more reduced bandwidth (or in other words, an even narrower spectrum) and thus further reduce the effects of dispersion on the transmission.

Further regarding claim 1, neither Ono et al. nor Kahn et al. specifically disclose or teach that the constellation generating apparatus is responsive to a data modulator clock signal. However, Shimizu et al. disclose a related system including a constellation generating apparatus (Figure 6A) that is responsive to input data and a clock signal (column 6, lines 56-60). It would

have been obvious to a person of ordinary skill in the art to include a clock signal as suggested by Shimizu et al. as part of the transmission in the system described by Ono et al. in view of Kahn et al. so that the timing of the signals may be readily detected at the receiver and therefore allow the data in the signals to be properly extracted (Shimizu et al., column 1, lines 12-17).

Regarding claim 2, Ono et al. disclose that the electrical delay between the amplitude modulator and the phase modulator may comprise a length of coaxial cable (column 1, lines 18-21; column 11, lines 7-11). Although they do not specifically disclose that the delay circuit (element 9 in Figure 8, for example) may comprise a length of coaxial cable, they clearly suggest that such a length of cable may produce a particular delay (i.e., the delay between the modulators in series as noted above). It would have been obvious to a person of ordinary skill in the art to specifically utilize a length of coaxial cable (as suggested by Ono et al.) as a delay circuit element in the system described by Ono et al. in view of Kahn et al. and Shimizu et al. as a known engineering design choice of a way to provide the particular delay required by the system. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claim 3, Kahn et al. further teach that the constellation generating apparatus (shown in detail in Figure 4a as providing the modulation signal s(t) that is input into the optical modulation system shown in Figure 5c, for example) comprises amplitude symbol mapping logic that is responsive to input data 21, weighting apparatus (amplifiers 172 and 173), summing apparatus 176, and amplifying apparatus (not shown in Figure 4a, but Figure 5b shows that the output of the summer 176 may be further amplified with amplifier 272 before being input into

the optical modulation system). Kahn et al. further teach that the elements of the constellation generating apparatus may provide an "amplitude" input (i.e., an input for an amplitude modulator such as element 282 shown in Figure 5c) and therefore may be considered an "amplitude portion."

Similarly, regarding claim 4, Kahn et al. further teach that the constellation generating apparatus (shown in detail in Figure 4a as providing the modulation signal s(t) that is input into the optical modulation system shown in Figure 5c, for example) comprises phase angle mapping logic that is responsive to input data 21, weighting apparatus (amplifiers 172 and 173), summing apparatus 176, amplifying apparatus (not shown in Figure 4a, but Figure 5b shows that the output of the summer 176 may be further amplified with amplifier 272 before being input into the optical modulation system), and delaying apparatus (elements 159 and 166, for example). Kahn et al. further teach that the elements of the constellation generating apparatus may provide an "phase" input (i.e., an input for a phase modulator such as element 290 shown in Figure 5c) and therefore may be considered a "phase portion."

Examiner notes that claim 3 only recites that the constellation generating apparatus includes an amplitude portion comprising particular elements, while claim 4 only recites that the constellation generating apparatus includes a phase portion comprising particular elements; since claim 4 does not depend on claim 3, none of the claims recites a constellation generating apparatus comprising both amplitude portion and phase portion elements that are specifically distinct from each other.

Regarding both claims 3 and 4, again it would have been obvious to a person of ordinary skill in the art to use the arbitrary M-ary constellation generating apparatus taught by Kahn et al.

in the system disclosed by Ono et al. in order to provide optical signals having a more reduced bandwidth (or in other words, an even narrower spectrum) and thus further reduce the effects of dispersion on the transmission.

Regarding both claims 3 and 4, again Kahn et al. does not specifically disclose that the constellation generating apparatus is responsive to a clock signal, but Shimizu et al. disclose a related system including a constellation generating apparatus (Figure 6A) that is responsive to input data and a clock signal (column 6, lines 56-60). It would have been obvious to a person of ordinary skill in the art to include a clock signal as suggested by Shimizu et al. as part of the transmission in the system described by Ono et al. in view of Kahn et al. so that the timing of the signals may be readily detected at the receiver and therefore allow the data in the signals to be properly extracted (Shimizu et al., column 1, lines 12-17.)

Regarding claim 5, Ono et al. disclose that the modulation format of the optical signal of an optical link is reconfigured to maximize data transmission for a varying available link optical dynamic range (column 7, lines 31-45). Although Ono et al. do not further specifically disclose that the modulation maximizes transmission for a varying allowed bit error rate, it is also well known in the art that while high data transmission rates are desirable for efficiency, transmission rates need to be balanced against the potential corresponding increase in error rates. Kahn et al. also further teaches maximizing transmission for a varying allowed bit error rate (column 13, lines 35-42). It would have been obvious to a person of ordinary skill in the art to further maximize data transmission for a particular bit error rate as taught by Kahn et al. in the system described by Ono et al. in view of Kahn et al. and Shimizu et al. simply in order to provide a data transmission that is efficient but without an unacceptable amount of errors.

Regarding claim 8, Ono et al. disclose that the system compensates for performance variations in the components of a communication link. In particular, they disclose that reducing bandwidth, such as through mapping a data signal into a multi-level signal as they disclose, reduces waveform deterioration due to dispersion (column 1, lines 20-26).

Regarding claim 9, as similarly discussed above with regard to claim 1 and as well as it may be understood with regard to the claim objection discussed above, Ono et al. disclose an optical transmitting method (Figure 8) comprising the steps of:

outputting a laser beam (with element 1);

generating data points in response to input data that are used to amplitude and phase modulate the laser beam;

amplitude modulating the laser beam corresponding to the data points (using amplitude modulator 2);

delaying the data points (using delay element 9) used for phase modulation to synchronize it with the amplitude modulated laser beam;

phase modulating the amplitude modulated laser beam corresponding to delayed data points to produce an amplitude modulated output beam (using phase modulator 3).

Ono et al. do not specifically generating an arbitrary M-ary constellation of data points.

However, again Kahn et al. teach generating an arbitrary M-ary constellation of data points that may be used to provide input data to the amplitude and phase modulators (shown in detail in Figure 4a as providing the modulation signal s(t) that is input into the optical modulation system shown in Figure 5c, for example; column 3, lines 50-63; column 4, lines 53-

55). Examiner notes that Kahn et al. teach that an "arbitrary" M-ary constellation may be generated, since they disclose that M may be simply any number greater than or equal to 2.

Ono et al. already disclose that reducing bandwidth, such as through mapping a data signal into a multi-level signal as they disclose, reduces waveform deterioration due to dispersion (column 1, lines 20-26). However, Kahn et al. particularly teach that M-ary modulation, where M is greater than 2, provides optical signals having a narrower optical spectrum than in systems where M=2 (i.e., the system disclosed by Ono et al.) and therefore dispersion would be further reduced (Kahn et al, column 2, lines 24-32; column 3, lines 11-14; column 5, lines 44-48). Therefore, it would have been obvious to a person of ordinary skill in the art to generate arbitrary M-ary constellation data points as taught Kahn et al. in the method disclosed by Ono et al. in order to provide optical signals having a more reduced bandwidth (or in other words, an even narrower spectrum) and thus further reduce the effects of dispersion on the transmission.

Further regarding claim 1, neither Ono et al. nor Kahn et al. specifically disclose or teach that the step of generating is responsive to a clock signal. However, Shimizu et al. disclose a related system including a constellation generating apparatus (Figure 6A) that is responsive to input data and a clock signal (column 6, lines 56-60). It would have been obvious to a person of ordinary skill in the art to include a clock signal as suggested by Shimizu et al. as part of the transmission in the method described by Ono et al. in view of Kahn et al. so that the timing of the signals may be readily detected at the receiver and therefore allow the data in the signals to be properly extracted (Shimizu et al., column 1, lines 12-17).

Regarding claim 10, Ono et al. does not specifically disclose a Gray code, but Kahn et a. further teach generating data points include a Gray code (column 13, lines 35-42). It would have

been obvious to a person of ordinary skill in the art to further include Gray code as taught by Kahn et al. in the method described by Ono et al. in view of Kahn et al. and Shimizu et al. in order to reduce the number of errors in the transmission (Kahn et al., column 13, lines 40-42).

6. Claims 11-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono et al. in view of Kahn et al. (again, US 6,445,476 B1).

Regarding claim 11, as similarly discussed above with regard to claims 1 and 9, Ono et al. disclose a system for transmitting a modulated optical signal (Figure 8) comprising:

an amplitude modulator 2 for amplitude modulating an optical signal;

a phase modulator 3 for phase modulating the optical signal; and

an apparatus for generating an amplitude control signal and a phase control signal from an input data signal, wherein the amplitude control signal is input to the amplitude modulator and the phase control signal is input to the phase modulator (Figure 8 shows how an input data signal is input to both modulators).

Ono et al. does not specifically disclose that the amplitude control signal and the phase control signal comprise an arbitrary M-ary constellation of data points such that the amplitude- and phase- modulated optical signal is an arbitrary M-ary modulated optical signal.

However, again Kahn et al. teach a constellation generating apparatus for generating an arbitrary M-ary constellation of data points that may be used to provide input data to the amplitude and phase modulators (shown in detail in Figure 4a as providing the modulation signal s(t) that is input into the optical modulation system shown in Figure 5c, for example; column 3, lines 50-63; column 4, lines 53-55). Examiner notes that Kahn et al. teach that an "arbitrary" M-

ary constellation may be generated, since they disclose that M may be simply any number greater than or equal to 2.

Regarding claim 18 in particular, Kahn et al. also teach that the constellation generating apparatus is reconfigured to generate respective amplitude control and phase control signals to produce an optical signal for maximizing data transmission over present optical link conditions. Kahn et al. teach that M-ary modulation, where M is greater than 2, provides optical signals having a narrower optical spectrum than in systems where M=2 (i.e., the system disclosed by Ono et al.) and therefore dispersion would be further reduced (Kahn et al, column 2, lines 24-32; column 3, lines 11-14; column 5, lines 44-48).

Ono et al. already disclose that reducing bandwidth, such as through mapping a data signal into a multi-level signal as they disclose, reduces waveform deterioration due to dispersion (column 1, lines 20-26). Therefore, regarding claims 11 and 18, it would have been obvious to a person of ordinary skill in the art to generate arbitrary M-ary constellation data points as taught Kahn et al. in the method disclosed by Ono et al. in order to provide optical signals having a more reduced bandwidth (or in other words, an even narrower spectrum) and thus further reduce the effects of dispersion on the transmission.

Regarding claim 12, Ono et al. disclose that the amplitude modulator may modulate the optical signal before the phase modulator modulates the optical signal (see Figure 8) and that the system further comprises a delay 9, the delay delaying the phase control signal to synchronize the phase modulation of the optical signal with a delay between the amplitude modulator and the phase modulator (column 7, lines 22-30).

Regarding claim 13, Ono et al. disclose that the phase modulator may modulate the optical signal before the amplitude modulator modulates the optical signal (see Figure 13) and that the system further comprising a delay 9. Although Ono et al. do not specifically disclose that the delay element 9 delays the amplitude control signal, they clearly disclose that the delay is used to synchronize the electrical control signals with the delay between the modulators (column 7, lnes 22-30), and it would be well understood in the art that a delay element may be similarly used to delay the amplitude control signal to achieve the same purpose. It would have been obvious to a person of ordinary skill in the art to specifically delay the amplitude control signal (instead of the phase control signal) in the system described by Ono et al. in view of Kahn et al. as an engineering design choice of a way to synchronize the signals as already disclosed. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claims 14 and 15, Kahn et al. further teach that the constellation generating apparatus (such as shown in detail in Figure 4a) includes an adaptable amplitude symbol mapping logic having a plurality of outputs (such as signals 155a and 155b), the outputs being weighted (using amplifiers 172 and 173) and combined to form the amplitude control signal (using summer 176). Kahn et al. further teach that the elements of the constellation generating apparatus may provide an amplitude control signal (i.e., an input for an amplitude modulator such as element 282 shown in Figure 5c) and therefore may be considered amplitude symbol mapping logic.

Regarding claims 16 and 17 (as well as claim 17 may be understood with regard to 35 U.S.C. 112 discussed above, Kahn et al. further teach that the constellation generating apparatus (such as shown in detail in Figure 4a) includes an adaptable phase symbol mapping logic having a plurality of outputs (such as signals 155a and 155b), the outputs being weighted (using amplifiers 172 and 173) and combined to form the phase control signal (using summer 176). Kahn et al. further teach that the elements of the constellation generating apparatus may provide a phase control signal (i.e., an input for a phase modulator such as element 290 shown in Figure 5c) and therefore may be considered phase symbol mapping logic.

Regarding claims 14-17, again it would have been obvious to a person of ordinary skill in the art to use the arbitrary M-ary constellation generating apparatus taught by Kahn et al. in the system disclosed by Ono et al. in order to provide optical signals having a more reduced bandwidth (or in other words, an even narrower spectrum) and thus further reduce the effects of dispersion on the transmission.

7. Claims 6 and 7 rejected under 35 U.S.C. 103(a) as being unpatentable over Ono et al. in view of Kahn et al. and Shimizu et al. as applied to claim 1 above, and further in view of Lindoff (US 2003/0012289 A1) and Murakami et al. (US 6,307,985 A).

Regarding claims 6 and 7, Ono et al. in view of Kahn et al. and Shimizu et al. describe a system as discussed above with regard to claim 1. Neither Ono et al. nor Kahn et al. further explicitly refer to nonlinearity or self-phase modulation in the optical link, although Ono et al. do disclose that reducing bandwidth, such as through mapping a data signal into a multi-level signal as they disclose, reduces waveform deterioration due to chromatic dispersion (column 1, lines 20-26). Kahn et al. also teach that M-ary modulation using the constellation generating apparatus

they teach may reduce chromatic dispersion by reducing bandwidth (column 2, lines 24-32; column 3, lines 11-14; column 5, lines 44-48).

However, Murakami et al. specifically teach that nonlinear effects, wherein self-phase modulation is one particular type of such nonlinear effect, cause chromatic dispersion in an optical link (column 1, lines 8-38). It would have been obvious to a person of ordinary skill in the art that the compensation of chromatic dispersion already noted in the system described by Ono et al. in view of Kahn et al. and Shimizu et al. would necessarily result in a compensation of nonlinear self-phase modulation effects as well (since Murakami et al. teach that those effects include the dispersion).

Further regarding claims 6 and 7, Ono et al. in view of Kahn et al. and Shimizu et al. do not specifically disclose or teach predistorting the transmitted constellation. However, Lindoff teaches a system related to the one described by Ono et al. in view of Kahn et al. and Shimizu et al. including a constellation generating apparatus for generating data points (Figures 4A and 4B). Lindoff further teaches predistorting the constellation to additionally reduce bandwidth in the transmission (paragraphs 0001 and 0048-0053).

It would have been obvious to a person of ordinary skill in the art to include predistortion as taught by Lindoff in the system described by Ono et al. in view of Kahn et al. and Shimizu et al. in order to again further reduce bandwidth in the modulated signal and thus further reduce the dispersion (and nonlinear self-phase modulation as additionally taught by Murakami et al.) experienced in the ultimately produced transmission in the optical link. One in the art would have been particularly motivated to include the predistortion taught by Lindoff in the system described Ono et al. in view of Kahn et al., Shimizu et al., and Murakami et al. in order to ensure

that the effects of dispersion were minimized so that the communications could be received efficiently while having few errors.

8. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono et al. in view of Kahn et al. as applied to claim 11 above, and further in view of Lindoff and Murakami et al.

Regarding claims 19 and 20, Ono et al. in view of Kahn et al. describe a system as discussed above with regard to claim 11. As similarly discussed above with regard to claims 6 and 7, neither Ono et al. nor Kahn et al. further explicitly refer to nonlinearity or self-phase modulation in the optical link, although Ono et al. and Kahn et al. both suggest reducing bandwidth in the data signal to ultimately reduce chromatic dispersion in the modulated optical signal.

Again, Murakami et al. specifically teach that nonlinear effects, wherein self-phase modulation is one particular type of such nonlinear effect, cause chromatic dispersion in an optical link (column 1, lines 8-38). It would have been obvious to a person of ordinary skill in the art that the compensation of chromatic dispersion already noted in the system described by Ono et al. in view of Kahn et al. would necessarily result in a compensation of nonlinear self-phase modulation effects as well (since Murakami et al. teach that those effects include the dispersion).

Further regarding claims 19 and 20, Ono et al. in view of Kahn et al. do not specifically disclose or teach predistorting the transmitted constellation. However, Lindoff teaches a system related to the one described by Ono et al. in view of Kahn et al. and Shimizu et al. including a constellation generating apparatus for generating data points (Figures 4A and 4B). Lindoff

further teaches predistorting the constellation to additionally reduce bandwidth in the transmission (paragraphs 0001 and 0048-0053).

It would have been obvious to a person of ordinary skill in the art to include predistortion as taught by Lindoff in the system described by Ono et al. in view of Kahn et al. in order to again further reduce bandwidth in the modulated signal and thus further reduce the dispersion (and nonlinear self-phase modulation as additionally taught by Murakami et al.) experienced in the ultimately produced transmission in the optical link. One in the art would have been particularly motivated to include the predistortion taught by Lindoff in the system described Ono et al. in view of Kahn et al. and Murakami et al. in order to ensure that the effects of dispersion were minimized so that the communications could be received efficiently while having few errors.

Response to Arguments

9. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection. However, since the rejections in this Office Action rely on some references (Ono et al., Shimizu et al., and Lindoff) that are the same as those in the previous Action, and also on a reference (Kahn et al. '476) including several figures and disclosures/teachings that are substantially similar those in a reference relied upon in the previous Action, Examiner further notes that Applicant's arguments filed 29 March 2004 have been fully considered but they are not persuasive.

The new grounds of rejection in this Office Action (mainly, the new reliance on Kahn et al. '476 instead of Kahn et al. '444) are made by Examiner not as a result of any of Applicant's arguments, but because Examiner notes that Kahn et al. '476 teach the limitations of claims 3, 4, and 14-17 more clearly and in greater detail than Kahn et al. '444.

In response to Applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In the instant case, Applicant has submitted some of the individual disclosures/teachings of Ono et al., Kahn et al., and Shimizu et al. on page 6 of their response, but Examiner respectfully notes that the rejections of the claims are based on combinations of these references.

Examiner further respectfully disagrees with Applicant's assertion that Kahn et al. does not teach an arbitrary M-ary amplitude modulated constellation of data points. Examiner notes that Kahn et al. teach that an "arbitrary" M-ary constellation may be generated, since they disclose that M may be simply any number greater than or equal to 2.

In response to Applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. However, so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the Applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In the instant case, Examiner notes the support for the combination of Ono et al. and the teachings of Kahn et al., for example, does not rely on knowledge from only Applicant's disclosure. Examiner again notes that Ono et al. already disclose that reducing bandwidth, such as through mapping a data signal into a multi-level signal as they disclose, reduces waveform

deterioration due to dispersion (column 1, lines 20-26). However, Kahn et al. particularly teach that M-ary modulation, where M is greater than 2, provides optical signals having a narrower optical spectrum than in systems where M=2 (i.e., the system disclosed by Ono et al.) and therefore dispersion would be further reduced (Kahn et al., column 2, lines 24-32; column 3, lines 11-14; column 5, lines 44-48). Therefore, it would have been obvious to a person of ordinary skill in the art to use the arbitrary M-ary constellation generating apparatus taught by Kahn et al. in the system disclosed by Ono et al. in order to provide optical signals having a more reduced bandwidth (or in other words, an even narrower spectrum) and thus further reduce the effects of dispersion on the transmission.

In response to Applicant's argument that the references fail to show certain features of Applicant's invention, it is noted that the features upon which Applicant relies (i.e., predistortion with respect to the rejection of claim 1 over Ono et al., Kahn et al., and Shimizu et al.) are not recited in the rejected claim(s) (particularly claim 1). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claims 6, 7, 19, and 20, Examiner respectfully disagrees with Applicant's assertion on page 8 of the response that "the fact that the Lindoff publication discusses predistortion is irrelevant to the teachings of the cited patents." Again, in response to Applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. However, so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was

made, and does not include knowledge gleaned only from the Applicant's disclosure, such a reconstruction is proper. Examiner notes that the addition of the teaching of predistortion by Lindoff to the already established combination of Ono et al. and Kahn et al. does not rely on knowledge from only Applicant's disclosure. Lindoff specifically teaches a constellation generating apparatus related to the one already established in the combination of Ono et al. in view of Kahn et al. Lindoff further teaches predistorting the constellation to reduce the bandwidth of a data signal. Since Ono et al. and Kahn et al. each already suggest that reduction of bandwidth in the data signals used by the optical modulators that they teach results in reduced dispersion of the ultimately transmitted optical signals, it follows that the predistortion taught by Lindoff would reduce bandwidth further and thereby further reduce dispersion in the resulting combined system.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 703-605-1186. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 703-305-4729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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